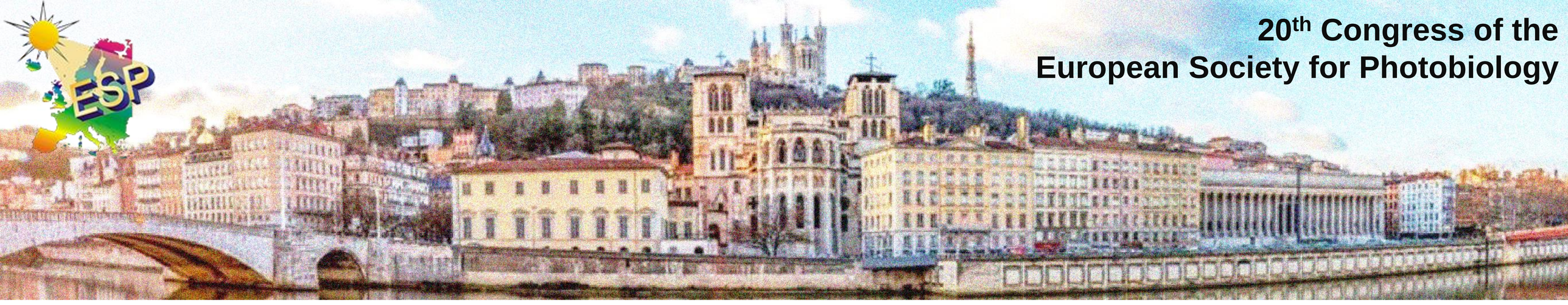

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A study of Wastewater Disinfection with Photodynamic Treatment and its Ecotoxicological Effects

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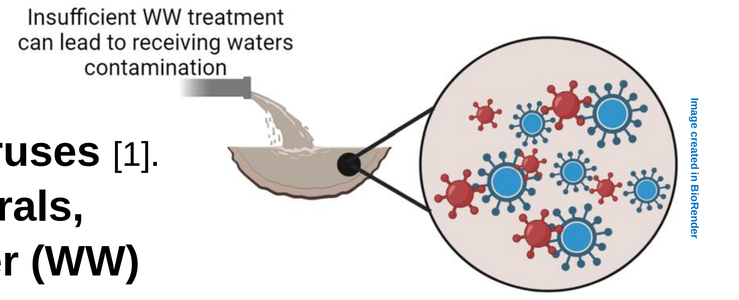
Introduction

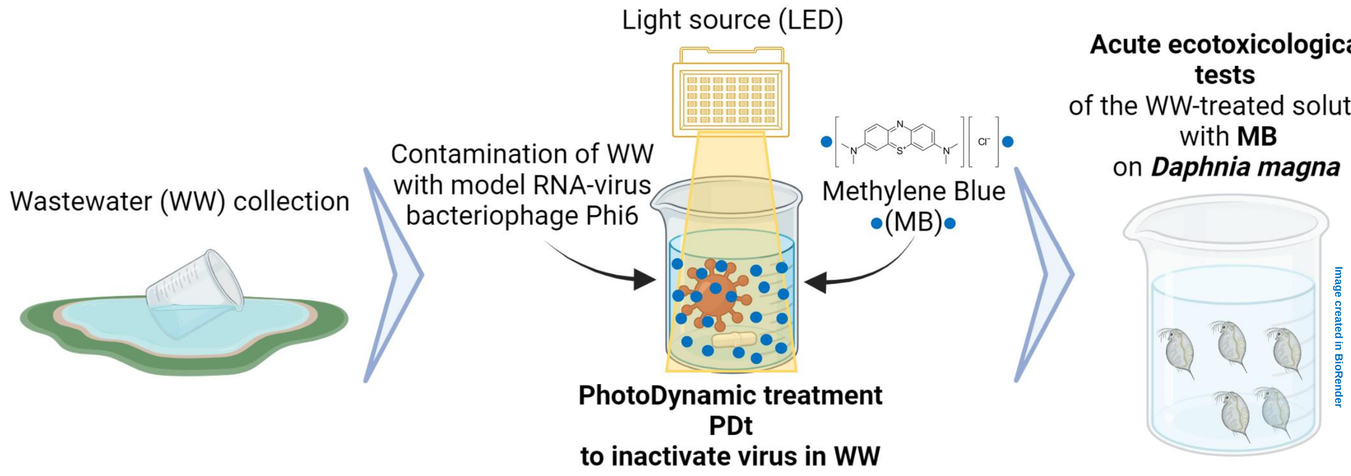
Viruses have higher mutation rates when compared with other microorganisms, **particularly RNA viruses** [1]. The **higher mutation rate promotes the development of resistance to traditional antivirals, establishing a resistance behavior in viruses' populations** [1]. **RNA viruses in wastewater (WW) have already been reported, leading to potential public health risks** [2]. **Wastewater treated with conventional antimicrobial approaches** (tertiary WW treatments) like UV light, chlorine, and ozone **can lead to virus mutations and the formation of toxic by-products harmful to humans and the environment** [3]. All this, **highlights the inevitability to provide alternative WW disinfection techniques**.

Antimicrobial Photodynamic treatment (PDt) is being **considered a promising alternative to viruses' inactivation without the generation of viral mutations or toxic by-products** [4,5].



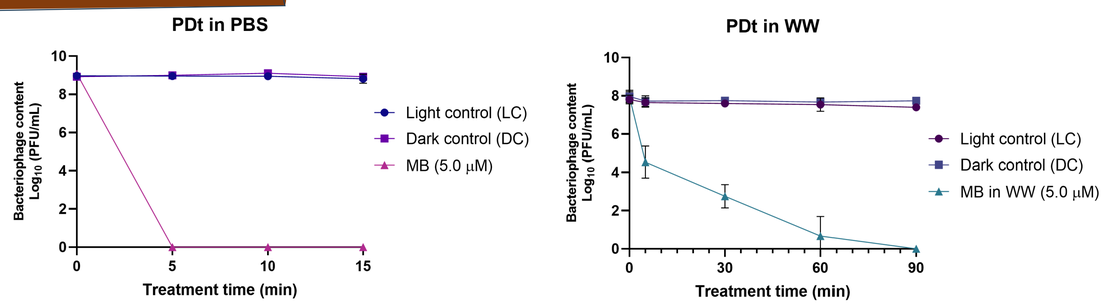
Can **PhotoDynamic treatment** (**PDt**) be a good **WW disinfection method** to **inactivate VIRUSES**?

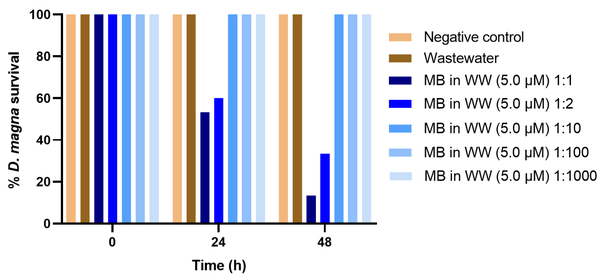
Methods



Results

The disinfection protocol developed with MB (at 5.0 µM; irradiance 50 mW/cm^2) **resulted in an efficient inactivation of the model RNA-virus bacteriophage Phi6**, both in PBS and in the real WW.





Considering that **treated effluents are released into receiving waters**, the **acute toxicity of PDt-treated WW to the model organism *Daphnia magna* was evaluated through exposure to the PDt-treated WW,** under different dilution conditions.

Preliminary results of the acute toxicity of PDt-treated WW in *Daphnia magna* showed that **daphnids survival when exposed to PDt-treated WW was increased when considering the dilution factor**.

Conclusions and Future Perspectives

PDt under adequate conditions can be considered an environmentally friendly and cost-effective approach in Wastewater Disinfection.

The main challenge in applying PDt to WW disinfection treatment may be retaining PS molecules post-treatment. However, this can be overcome by **immobilizing PS molecules on solid supports**, **enabling their recovery for reuse**.

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